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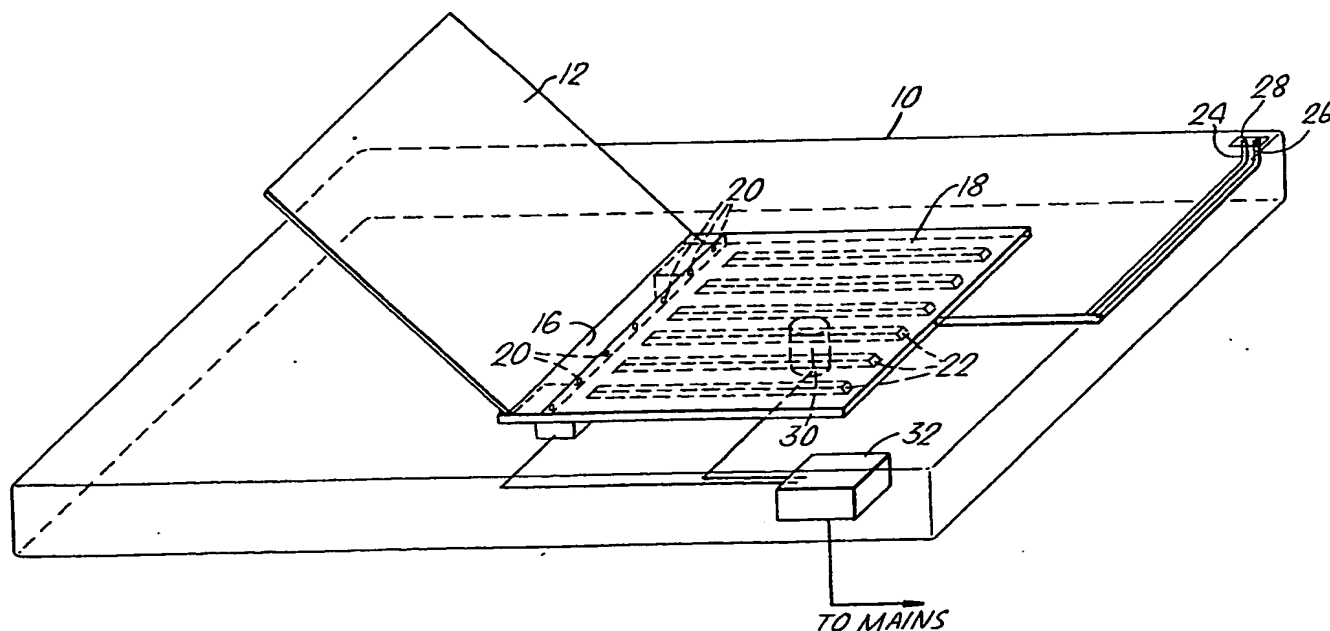
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(54) Title: MATTRESSES**(57) Abstract**

A mattress (10) incorporating means to simulate the heartbeat of an adult, preferably a mother, which comprises a sound chamber (30), means to simulate heartbeat and power means therefor. The heartbeat may be simulated by a pulse generator circuit having its output connected via an audio amplifier circuit to at least one loudspeaker (Fig. 5). In addition means may be provided to simulate the respiratory movements of an adult.

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MATTRESSES

This invention relates to a mattress for beds, cots, prams or the like and is for particular but not exclusive, use in paediatrics and psychology, and in obviating or mitigating the incidence of a disease, illness or condition resulting in death during sleep, commonly referred to as
5 a "cot death".

According to one aspect of the invention there is provided a mattress incorporating means to simulate the heartbeat of an adult, preferably a mother, which comprises a sound chamber, means to simulate heart-
10 beat and power means therefor.

The means to simulate heartbeat may comprise a pulse generator circuit having its output connected via an audio amplifier circuit to at least one loudspeaker, all located within the mattress. The pulse generator may
15 produce an alternating current output which is half wave rectified for input to the audio amplifier circuit, the audio amplifier circuit being arranged to produce an harmonic distortion effect on the positive rising edge of the input signal thereto, so as to produce a
20 realistic heartbeat signal to the or each loudspeaker.

The power means comprises a transformer connected to supply at least one regulator via a bridge rectifier circuit, and may include both a fixed and an adjustable regulator circuit.

25 The mattress may also incorporate means to simulate the respiratory movements of an adult.

According to a further aspect of the invention there is provided a mattress incorporating means to simulate heartbeat and respiratory movements of an adult,
30 preferably a mother, the means including a pump having a piston actuatable in a chamber, the pump communicating with at least one inflatable bag having inlet and outlet pipes leading to an outer surface of the mattress to

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draw in or exhaust air into or from said bag on
actuation of said piston to cause movement in the top
of the mattress, a sound chamber and mechanism to
simulate heartbeat, and power means to operate the
5 pump and mechanism.

In this instance the mechanism may be a tape play-
back mechanism, the sound chamber may be provided with
an amplifier and loudspeaker and the tape play-back
mechanism may be one suitable for use with cylindrical
10 tapes.

Two embodiments of the present invention will now
be described, by way of example, with reference to
the accompanying diagrammatic drawings, in which:-

Fig. 1 is a perspective view of mattress according
15 to one embodiment of the present invention, the mattress
being shown in outline only and uncovered, an access
cover being shown in an open position;

Fig. 2 is a plan view of the mattress of Fig. 1
with the access cover removed for clarity;

20 Fig. 3 is a longitudinal sectional view on the line
III-III of Fig. 2; and

Figs. 4 and 5 are respective block schematic
diagrams of a power supply circuit and heartbeat
simulator circuit for incorporation into a mattress.

25 Referring to Figs. 1, 2 and 3 of the drawings, a
mattress is of any suitable depth and areal dimensions
for use with beds, cots, prams or like articles for
sleeping, and can be separate from or built into said
articles. The mattress may be of any conventional
30 spring mattress, but is preferably of a foamed material,
such as Dunlopillo (RTM). The mattress 10 has
incorporated therein means to simulate the temperature,
heartbeat and respiratory movements of an adult, preferably
the mother. A hole of required areal and depth
35 dimensions is provided in the mattress. With an opening

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10 at the top of the hole being made from the top of the mattress and an access cover 12 to overlie said opening 10 being provided. The hole is positioned toward the end of the mattress intended to be at the head of the
5 bed by the width of a pillow and the cover 12 is hinged at the side remote from said head.

A pump having a rectangular piston 14 and a rectangular box chamber 16 is provided at said hinge side and communicates with an inflatable bag 18 of rectangular
10 shape to fit said hole. The bag 18 has a series of port vents 20 in the pump side and communicating with the bag 18. The bag 18 has a series of ribs 22 to define there-between a series of channels running from said hinge side to the opposite end. The vents 20 are aligned one
15 to each channel. Inlet and outlet pipes 24, 26 are provided with similar ends secured as shown at a side of the mattress inward from an air filter 28. The outlet pipe 26 connects to the opposite end of the bag 18, with the inlet pipe 24 connecting to the pump chamber
20 16. Non-return valves are provided at the ends adjacent the air filter 28.

Below the bag, a sound chamber 30 is provided associated with a tape play-back mechanism (not separately identified). The play-back mechanism is one suitable for
25 use with cylindrical tapes. The sound chamber is provided with an amplifier and loudspeaker (not shown). The pump and mechanism, amplifier and loudspeaker are operated by power means in the form of batteries or mains electricity and the necessary circuit wiring is provided. In the
30 former, a cabinet 32 to hold the batteries is provided, and in the latter the cabinet 32 houses an AC/DC converter and an electrical lead with a plug is provided from said converted.

In use, the pump operates to inflate and exhaust
35 the bag 18 to simulate respiratory movements, and the

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play-back mechanism reproduces heartbeats from the tape. Also, the noise of respiratory movements are reproduced either by the inhaling or exhausting of air or by the tape. The mechanical action of the pump creates heat
5 which simulates body warmth.

Babies, before being born, are used to the heart-beat and respiratory movements as heard and felt in the mother's womb, only to be divorced from such sounds and movements after being born. It is proposed that this
10 may be a critical aspect which some babies after the trauma of being born, may pine for sensing isolation from a protective presence.

The tape is preferably made on an individual basis from the actual mother prior to birth to achieve as
15 authentic on reproduction of sounds as possible and the timing of the pump can be correspondingly increased or decreased by a timer or like component placed in circuit with the pump.

A mechanism sound-responsive to a baby's cry or
20 whimper may be provided associated with a second tape and play-back mechanism to operate said play-back mechanism to play-back a soothing phrase or comment of the mother.

The means in the mattress and the mattress itself
25 of the present invention can be used until such time as the baby or young child is weaned from said sounds and movements.

Referring now to Figs. 4 and 5 of the drawings there are shown circuits of a power supply and an electronic
30 heartbeat simulator which may be utilised with the mattress of Figs. 1, 2 and 3 or may be utilised alone in a mattress.

The power supply circuit of Fig. 4 comprises a switch
35 S1 for connection between a mains power supply and the primary winding of a step-down transformer T1. The secondary winding of the transformer T1 is connected via

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a bridge rectifier to an adjustable regulator REG-1 and to a fixed regulator REG-2.

The output from the power supply circuit of Fig. 4 is connected to a heartbeat simulator circuit which consists of a pulse generator, followed by an audio IC amplifier stage connected to a loudspeaker. The pulse generator followed by a diode D2 generates a half-wave rectified sinusoidal output whose frequency is dependant on components C1, C2, R1, R2 and RV1 and the gain of the generator is dependant on R3 and R4.

The pulse generator comprises two BI-FET operational amplifiers IC1 and IC2.

The sinusoidal output which is forward-biased half-wave rectified by diode D1 is fed into the audio amplifier stage. This audio amplifier is in an IC package and hence requires very few external components. It behaves similarly to an operational amplifier IC and hence the gain is easily controllable with a 470 ohm potentiometer (RV2), R5 and R6 set a base gain for the amplifier. The IC provides two functions, firstly it provides an adjustable output to an 8 ohm loudspeaker L of high wattage (3 watts). This is the normal mode of operation for an IC amplifier. In this case, though, the amplifier provides a second (and more unusual) feature to the loudspeaker output.

The second feature is that the amplifier gain is deliberately biased so that slight distortion of the sine wave input occurs at moderate volume (amplification). A satisfactory volume range can be achieved by means of R5, R6 and RV2, which can create a slight rippling or harmonic distortion effect on the first 90° section of the sine wave input (the +ve(rising) edge of the rectified signal). This ripple creates a very realistic 'heart noise' which simulates the flow of blood through the heart before release of heart muscles. The R6 (330 ohm) resistor may be replaced by a 360 ohm preset

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potentiometer as this assists in finding a suitable volume range which has the blood flow simulation effect.

5 The circuits of Figs. 4 and 5 may be utilised with
the mattress of Fig. 1 to 3 but when used alone in a
mattress are believed to be almost as effective and
provide a simpler and cheaper device. When used alone
the loudspeaker or a number of loudspeakers are located
adjacent and beneath the upper surface of the mattress
10 so that a slight vibration thereof occurs in time with
the heartbeat pulse rate.

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CLAIMS:

1. A mattress incorporating means to to simulate the heartbeat of an adult, preferably a mother, which comprises a sound chamber, means to simulate heartbeat and power means therefor.
2. A mattress as claimed in Claim 1 wherein the means to simulate heartbeat comprises a pulse generator circuit having its output connected via an audio amplifier circuit to at least one loudspeaker, all located within
5 the mattress.
3. A mattress as claimed in Claim 2 wherein the pulse generator produces an alternating current output which is half wave rectified for input to the audio
5 amplifier circuit, the audio amplifier circuit being arranged to produce an harmonic distortion effect on the positive rising edge of the input signal thereto, so as to produce a realistic heartbeat signal to the or each loudspeaker.
4. A mattress as claimed in Claim 2 or 3 wherein the power means comprises a transformer connected to supply at least one regulator via a bridge rectifier circuit.
5. A mattress as claimed in Claim 4 including both a fixed and an adjustable regulator circuit.
6. A mattress as claimed in any preceding claim also incorporating means to simulate the respiratory movement of an adult.
7. A mattress incorporating means to simulate heartbeat and respiratory movements of an adult, preferably a mother, the means including a pump having a piston actuatable in a chamber, the pump communicating with at least one inflatable
5 bag having inlet and outlet pipes leading to an outer surface of the mattress to draw in or exhaust air into or from said bag on actuation of said piston to cause movement in the top of the mattress, a sound chamber and mechanism to simulate heartbeat, and power means to operate the

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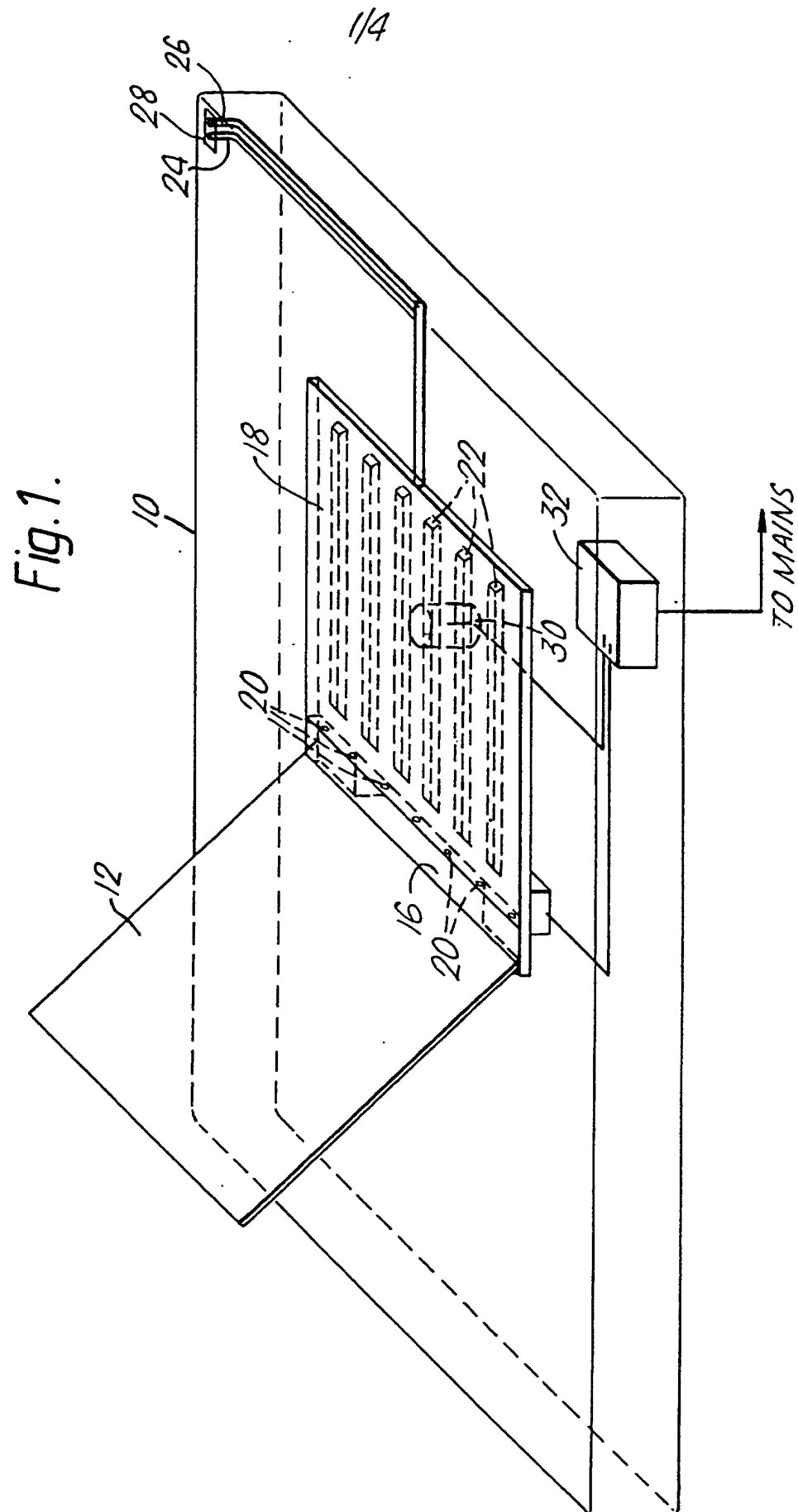
pump and mechanism.

8. A mattress as claimed in Claim 7 wherein the mechanism is a tape play-back mechanism, and preferably also the sound chamber is provided with an amplifier and loudspeaker.

9. A mattress substantially as hereinbefore described with reference to Figs. 1, 2 and 3 of the accompanying drawings.

10. A mattress substantially as hereinbefore described incorporating heartbeat simulator circuits substantially as hereinbefore described with reference to Fig. 5 or Figs. 4 and 5 of the accompanying

5 drawings.



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Fig.2.

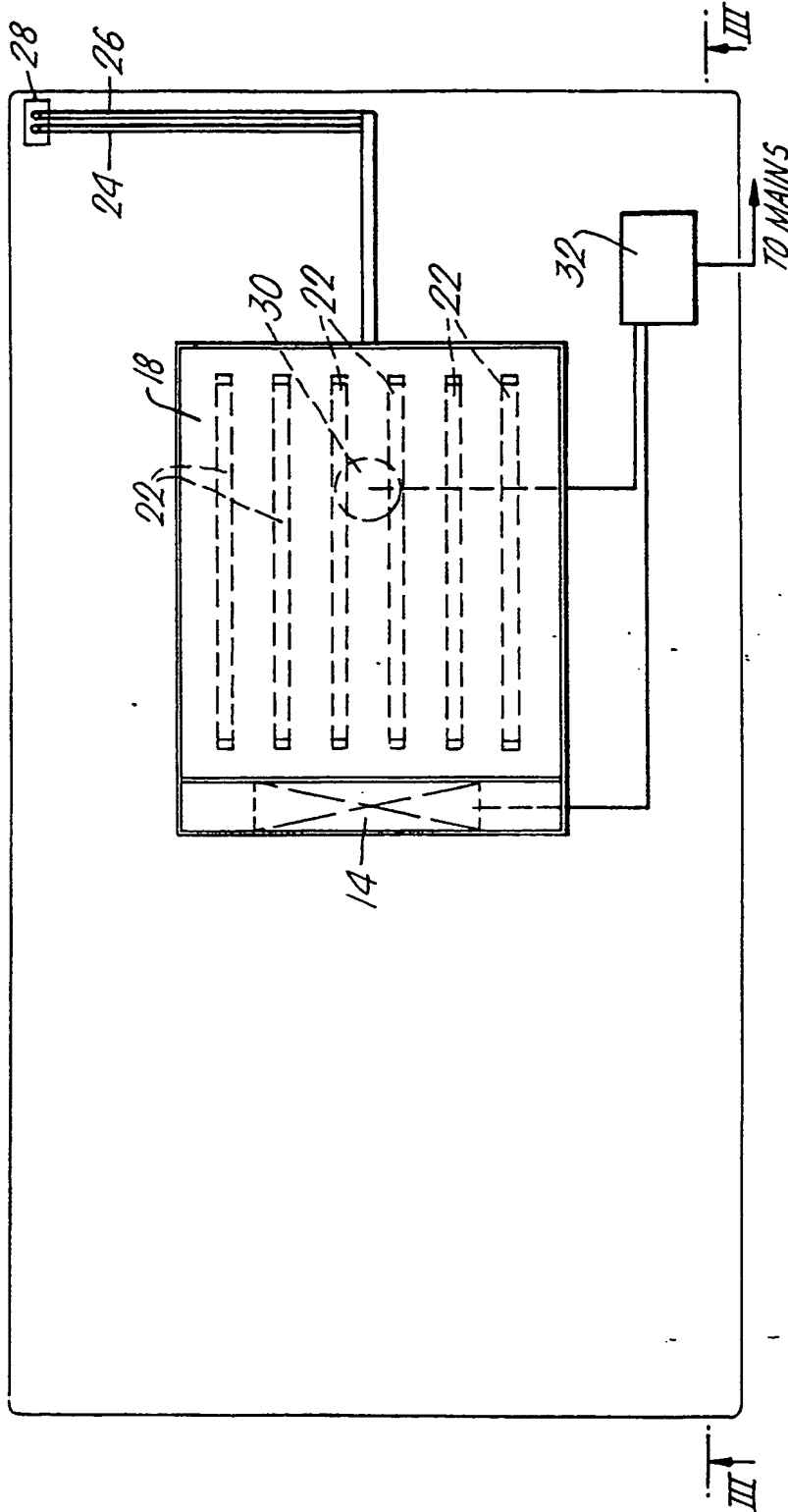
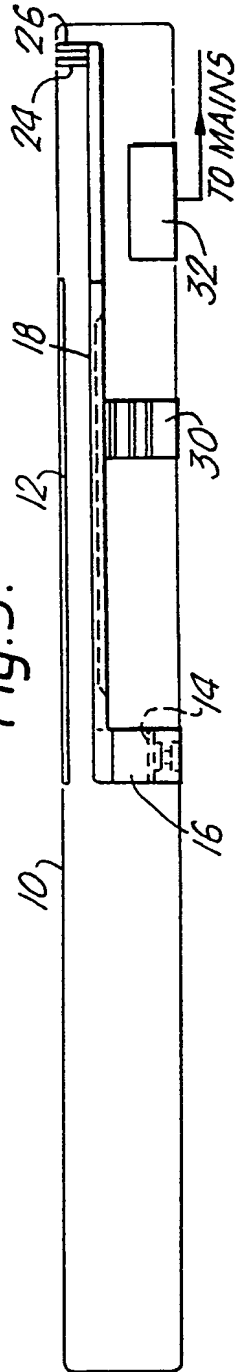
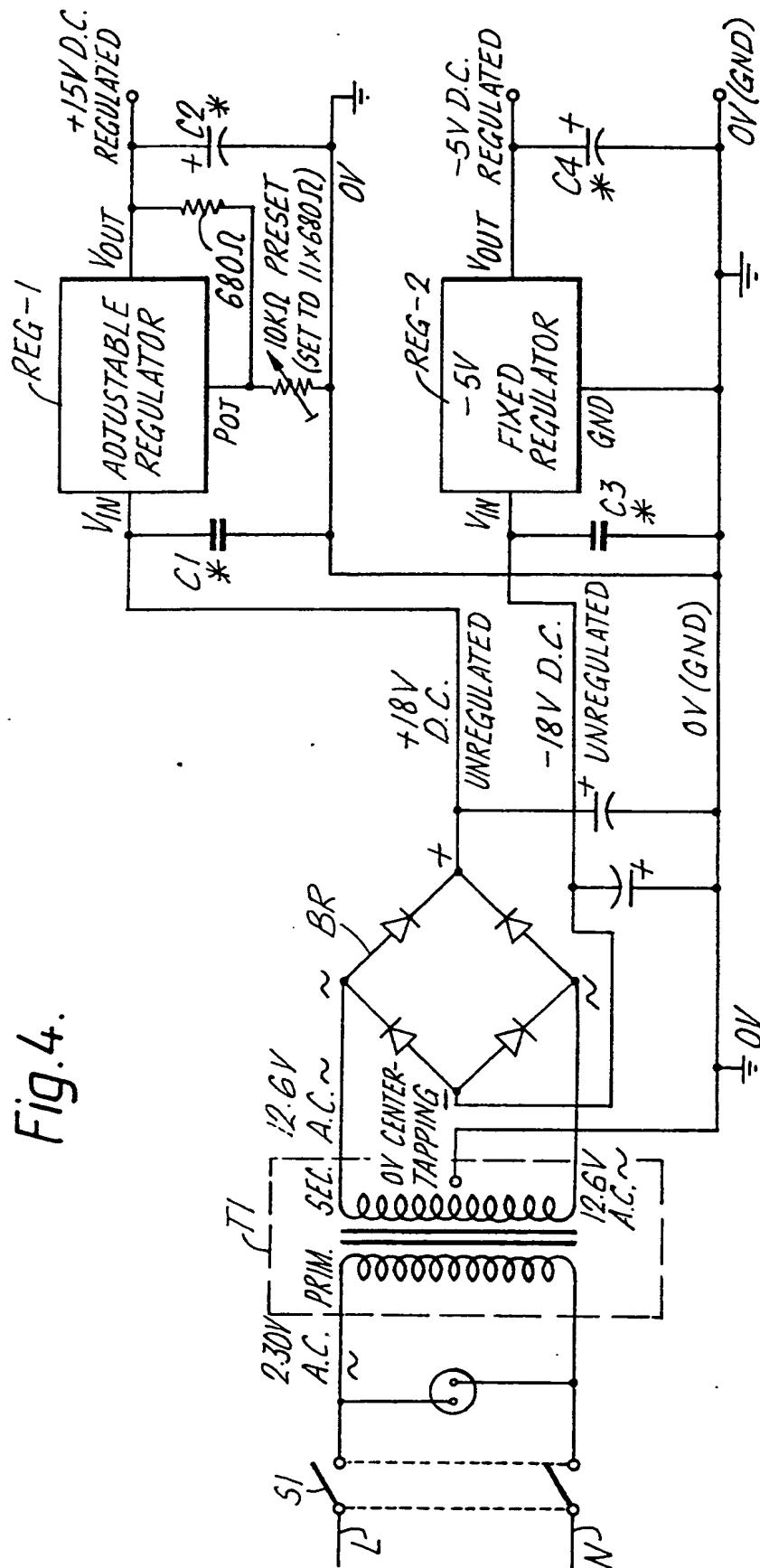


Fig.3.



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Fig. 5.

